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Rejections Under 35 USC §102 and §103

Claims 52-54, 60-62 and 70-76 have been rejected under 35 USC §102(b) as being anticipated by Farnworth '911 (US Patent No. 5,851,911).

Claims 56-59 have been rejected under 35 USC §102(b) as being anticipated by Dasse et al. '273 (US Patent No. 5,594,273).

Claims 63-66 have been rejected under 35 USC §102(b) as being anticipated by Cram (US Patent No. 6,462,575).

Claim 55 has been rejected under 35 USC §103(a) as being unpatentable over Farnworth '911 (US Patent No. 5,851,911) in view of Dasse et al. '273 (US Patent No. 5,594,273).

Claim 77 has been rejected under 35 USC §103(a) as being unpatentable over Farnworth '911 (US Patent No. 5,851,911) in view of Franklin et al. '324 (US Patent No. 6,427,324).

Argument

The claims have been amended to include recitations which patentably distinguish the invention from the prior art.

In the present component, laser patterned conductors function to redistribute component contacts, and also function to repair, reconfigure or electrically isolate defective dice on the substrate. The conductors thus perform a dual function which is achieved by laser patterning a redistribution layer using information from testing of the components on the substrate. Admittedly redistribution layers and redistribution conductors are known in the art. However, conductors which function to redistribute, and also to repair, reconfigure or electrically isolate defective dice are not disclosed or suggested by the art.

35 USC §102 And 35 USC §103 Rejections Of Claims 52-55 Over Farnworth '911

Farnworth '911 discloses a semiconductor substrate 1004-Figure 2h having repattern traces 1016-Figure 2h (conductors in present claims), which redistribute a pattern of bond pads 1002 (component contacts in present claims) to a pattern of solder balls 1032-Figure 2h (terminal contacts in present claims). Although Farnworth '911 discloses a component having a redistribution layer and conductors (repattern traces 1016), Farnworth '911 does not suggest or enable the concept of a redistribution layer and conductors which also perform repair functions.

Amended independent claim 52 recites "a substrate comprising a plurality of tested components including at least one defective component". In an illustrative embodiment the substrate comprises a semiconductor wafer and the components comprise dice or packages. Claim 52 also recites "a metal layer on the substrate comprising a plurality of conductors in electrical communication with the component contacts configured to redistribute the component contacts into selected patterns, and to repair the defective component by connecting selected component contacts on the defective component with selected integrated circuits on the defective component".

The metal layer in claim 52 thus serves the dual function of redistributing the pattern of the component contacts, and repairing the defective component by connecting selected component contacts to selected integrated circuitry, such as redundant circuitry (page 13, lines 30-33). Although repair structures are known in the art as exemplified by Franklin et al., the presently claimed redistribution layer is distinguishable over the art because it is configured using test data and laser imaging to both repair components and redistribute their contacts.

Amended dependent claim 53 recites "the components include a second defective component (Xed component 12D in Figure 4) and the conductors are configured to electrically isolate the second defective component." The conductors thus perform three functions: redistribution, repair and electrical isolation. Farnworth '011 does not disclose or suggest a redistribution layer with conductors configured to redistribute component contacts, to repair a defective component, and to electrically isolate a second defective component. In addition, an additional resistor element, such as the resistor 77 in Figure 4 of Dasse et al. is not required in the present component because the customized layout of the conductors performs the isolation function.

Amended dependent claim 54 recites "the components include a second defective component and the conductors are configured to reconfigure the component contacts on the second defective component." The conductors thus perform three functions: redistribution, repair and reconfiguration of component contacts. Farnworth '011 does not disclose or suggest a redistribution layer with conductors configured to redistribute component contacts, to repair a defective component, and to reconfigure a second defective component.

Amended dependent claim 55 recites "the components include a second defective component and the conductors are configured to electrically connect multiple components in a cluster that excludes the second defective component". With respect to the 35 USC §103 rejection of dependent claim 55 based on Farnworth '011 and Dasse et al. '273, the above arguments with respect to Farnworth et al '011 are essentially restated. Specifically, Farnworth et al. does not disclose or suggest multi functional redistribution conductors.

In addition, Dasse et al. '273 was cited as teaching conductors (45-Figure 2) configured to connect good components in a cluster (514-Figure 14). However, the clustering function is not accomplished using a

redistribution layer, which also performs a repairing function as presently claimed. In this regard column 23, line 12 to column 24, line 55 of Dasse et al. '273 describes a method for forming the clusters that uses multiple reticles to form different structures in each cluster (column 23, lines 22-27). There is no single redistribution layer having conductors which cluster multiple components, while electrically isolating a defective component.

In view of the recited features and differences over the art, claims 52-55 are submitted to be both novel and unobvious over Farnworth '911.

35 USC §102 Rejections Of Claims 56-59 Over Dasse et al. '273

Amended independent claim 56 recites "a metal layer on the substrate comprising a plurality of conductors configured to redistribute the patterns of the component contacts into selected patterns, and to electrically isolate the defective component on the substrate during burn-in testing of the good components."

The claimed layer and conductors thus serve the dual function of redistribution and electrical isolation during burn-in testing. Dasse et al. '273 teaches a resistor 77 which the Examiner has deemed to perform an isolation function. However, the resistor 77 merely limits current flow between a wafer conductor and a bonding pad (column 11, lines 24-26). Current limiting is not the same function as electrical isolation. In addition, the present conductors are configured to electrically isolate the whole defective component rather than just selected component contacts (e.g., bond pads) as in Dasse et al '273. Further, amended claim 56 states that the conductors are configured to perform electrical isolation during burn in testing of the good components on the substrate. Dasse et al. does not suggest configuring the conductors 45 to perform electrical isolation during burn in testing. In

view of these recited features and differences over the art, claims 56-59 are submitted to be both novel and unobvious over Dasse et al. '273.

Still further, amended dependent claim 58 includes additional recitations which further distinguish the claimed component from the art. Specifically claim 58 states "the conductors are configured to electrically connect a plurality of good components in a cluster that excludes the defective component". Dasse et al., taken alone or in combination with the art, does not teach a metal layer that performs the functions of redistribution, electrical isolation and clustering.

35 USC §102 Rejections Of Claims 60-62 Over Farnworth'911

Amended independent claim 60 recites "a metal layer on the substrate comprising a plurality of conductors configured to redistribute patterns of the component contacts into selected patterns, and to reconfigure the component contacts on the defective component."

The claimed metal layer thus performs the dual function of redistributing the component contacts, and reconfiguring the component contacts on a defective die. Although Farnworth '911 teaches a redistribution layer with conductors, there is no suggestion of a redistribution layer that also reconfigures component contacts on a defective component. Because of these recited features and differences over the art, amended claims 60-62 are submitted to be both novel and unobvious over Farnworth '911.

35 USC §102 Rejections Of Claims 63-66 Over Cram

Independent claim 63 is directed to a test board (48-Figure 6) that includes first test sites (50D-Figure 6) configured to electrically engage good components (12-Figure 6) on a substrate (10-Figure 6), and second test sites (50D-Figure 6) configured to electrically isolate defective components (12D-Figure 6) on the substrate (10-Figure 6).

In Cram a test board (40-Figure 7A) includes test pads (42-Figure 7A) "configured to contact all of the resilient contact structures 14 on the wafer 10 at the same time" (column 8, lines 30-33). In Cram electrical isolation of a non functional die (12NF-Figure 7A) is accomplished by deformation of the contact structures (14DE-Figure 7A) on the non functional dice (12NF-Figure 7A), rather than by the configuration of test sites on a test board as presently claimed.

In addition, amended independent claim 63 recites that the test board includes "a plurality of conductors configured to electrically connect the first test sites to a test circuitry and to electrically isolate the second test sites from the test circuitry". Although the conductors are not shown in Figure 6, they are equivalent to the conductors 22 shown in Figure 2J. The test circuitry 14 is shown in Figure 2B. In Cram elements 14 were described in the Office Action as being conductors on the test board. However, elements 14 comprise contact structures on the dice 12 being tested (column 5, lines 47-50).

In view of these recited features and the differences over the art, claims 63-66 are submitted to be both novel and unobvious over Cram.

35 USC §102 Rejections Of Claims 70-77 Over Farnworth '911

Amended independent claim 70 recites "a metal redistribution layer on the substrate comprising a plurality of conductors configured to redistribute the first patterns to the second patterns, and to electrically connect multiple components in a cluster that excludes the defective component".

Independent claim 70 thus recites a metal layer and conductors that performs the dual function of redistribution and clustering to exclude a defective component. As argued above on claim 55, neither Farnworth '911, nor the combination of Farnworth '911 and Dasse et al. '273, disclose a single redistribution layer having conductors which cluster multiple components, while electrically isolating a defective component.

In addition, amended dependent claim 77 recites the additional feature that "the conductors are configured to repair, reconfigure or electrically isolate the second defective component." The metal layer and conductors thus perform the functions of redistributing, clustering, and also the function of repairing, reconfiguring or isolating a second defective component.

In view of these recited features and differences over the art, amended claims 70-77 are submitted to be both novel and unobvious over Farnworth '911.

Conclusion

In view of the amendments and arguments, the rejections are submitted to have been overcome. Favorable consideration and allowance of claims 52-66 and 70-77 is respectfully requested.

An Information Disclosure Statement is also being filed concurrently with this Amendment. Should any issues arise that will advance this case to allowance, the Examiner is asked to contact the undersigned by telephone.

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